

AMENDMENTS TO THE CLAIMS

This listing will replace all prior versions, and listings, of claims, in the application:

Listing of Claims:

1. (currently amended) A diaphragm valve comprising:

a valve body having an inlet sleeve and an outlet sleeve each connected to an external entry port, the inlet sleeve and the outlet sleeve each having arched profiles in the longitudinal direction that converge to form a weir and a circular cross-section at the external entry port;

a fluid flow chamber where the inlet sleeve and the outlet sleeve converge, the fluid chamber having one part integral with the valve body and peripherally delimited by a body clamping flange, and another part comprising a bonnet to be sealably secured onto said valve body, the bonnet having a peripheral bonnet clamping flange substantially coincident with the body clamping flange;

a valve seat defined by the weir, the valve seat having an arched profile of substantially elliptical curvature and a flattened central surface; and

an open/close element comprising a single ~~storey-level~~ diaphragm made of an elastomeric material, the diaphragm comprising a peripheral sealing flange to be clamped between the body clamping flange and the bonnet clamping flange, said sealing flange being connected to a central dome, the dome having a convex side and a concave side, the concave side being oriented, in an unstressed position, toward the valve seat,

wherein the cross sections of the inlet sleeve and the outlet sleeve each have a semi-elliptical shape at the respective openings into the fluid flow chamber, the semi-elliptical shape being defined by an arched portion on the outer side and a flattened portion on the inner side, the semi-elliptical shapes converging at the valve seat and providing the substantially elliptical curvature,

wherein the sealing flange of the diaphragm has an elongated shape inscribing the dome of the diaphragm,

wherein the sealing flange is joined to the dome along a substantially elliptical edge having a longer central axis and a shorter central axis, and

wherein the dome is substantially shaped like a sector of an ellipsoid so to cooperate with the valve seat, the dome comprising a plurality of ribs disposed in symmetrical position

essentially parallel to a shorter axis of the dome on a side of the dome facing the bonnet and further comprising a rib disposed substantially along a longer axis of the dome on the side of the dome facing the bonnet.

2. (previously presented) The valve as claimed in claim 1, wherein the inlet sleeve and the outlet sleeve each have a cross section progressively widening in the direction substantially perpendicular to the flow direction and to the radius of curvature of the arched profile and progressively narrowing in the longitudinal direction of the inlet and outlet sleeves, and

wherein the flow chamber port has a shape that is elongated in the direction perpendicular to the longitudinal axis of the diaphragm valve, the sealing flange having a shape matching the shape of the bonnet clamping flange and inscribing the dome of the diaphragm.

3. – 5. (canceled)

6. (currently amended) The valve as claimed in claim ~~[[4]]~~1, further comprising one or more ribs disposed between the shorter and the longer axes of the dome.

7. (currently amended) The valve as claimed in claim 1, further comprising a ~~central~~centrally disposed circular stiffening member on the side of the dome facing the bonnet.

8. (canceled)

9. (previously presented) The valve as claimed in claim 1, wherein the dome has a constant thickness, and wherein at least some of the plurality of ribs have a thickness progressively increasing toward the center of the dome.

10. (previously presented) The valve as claimed in claim 1, further comprising means for retaining the periphery of the sealing flange in position, thereby preventing the sealing flange from sliding along the junction of the bonnet clamping flange and the body clamping flange.

11. (previously presented) The valve as claimed in claim 10, wherein said retaining means comprise one or more retaining projections extending in a substantially perpendicular direction from the sealing flange at the outer edges of the bonnet clamping flange.

12. (previously presented) The valve as claimed in claim 10, wherein the retaining means comprise two retaining tabs, each being provided along one of the longer sides of the sealing flange and extending over the corresponding surface of the outer edge of the body clamping flange with an orientation substantially perpendicular to the plane of said body clamping flange.

13. (previously presented) The valve as claimed in claim 10, wherein the retaining means comprise one or more bosses provided on the clamping surface of the body clamping flange and bonnet clamping flange, the one or more bosses compressing the corresponding portion of the sealing flange and further preventing the sealing flange from sliding out of position.

14. (previously presented) The valve as claimed in claim 10, wherein said retaining means comprise a substantially elliptic projection provided on the bonnet clamping flange, the substantially elliptic projection being positioned to be substantially parallel to the dome and to press against the sealing flange.

15. (previously presented) The valve as claimed in claim 1, further comprising means for centering the bonnet with respect to the valve body and for laterally limiting any outward extension of the sealing flange.

16. (previously presented) The valve as claimed in claim 15, wherein said means for centering comprise one or more retaining teeth arranged along the outer peripheral edge of the bonnet clamping flange and extending over the surface of the peripheral edge of the body clamping flange with a substantially perpendicular orientation to the plane of the body clamping flange.

17. (previously presented) The valve as claimed in claim 16, wherein said means for centering comprise a tab continuously extending at least along a portion of the peripheral edge

of the bonnet clamping flange and extending over the corresponding surface of the outer edge of the body clamping flange with a substantially perpendicular orientation with respect to the plane of said body clamping flange.

18. (previously presented) The valve as claimed in claim 1, wherein the sealing flange has at least one lip seal extending parallel to the peripheral edge of the dome and at a distance therefrom.

19. (previously presented) The valve as claimed in claim 1, further comprising a central, rounded lip seal on the side of the dome facing the valve seat, the lip seal extending along the longer axis of the dome and acting as a compliant element favoring the adhesion of the dome against the valve seat, so to prevent any fluid flow from the inlet sleeve to the outlet sleeve.

20. (previously presented) The valve as claimed in claim 1, further comprising a rib in an intermediate position at the opening of the outlet sleeve into the flow chamber, the rib being oriented in the flow direction and being substantially perpendicular to the plane tangent to the lower apex of the surface of the valve seat, the rib having a surface at the edge facing the dome that is flattened and curved to cooperate with the dome, so to prevent the dome from bulging when compressed against the valve seat.

21. (previously presented) The valve as claimed in claim 1, wherein the valve is a manually actuated valve, a mechanically actuated valve, a hydraulically actuated valve, or a servo actuated valve.

22. (previously presented) The valve as claimed in claim 21, wherein the valve is a mechanically actuated valve, further comprising a compressor element on the side of the dome facing the bonnet, the compressor element having a pressing surface of a shape complementary to the dome, the compressor being rotatably linked to the inner end of a slidable control stem which is passed through a hole formed in the bonnet.

23. (previously presented) The valve as claimed in claim 21, wherein the valve is a hydraulically operated valve, further comprising means for supplying a pressurized fluid

between the bonnet and the dome for compressing the dome against the valve seat and close the valve, and further comprising means for discharging said pressurized fluid and open the valve.

24. (previously presented) The valve as claimed in claim 1, further comprising means for elastically preloading the dome of the diaphragm towards the valve seat.

25. (previously presented) A diaphragm valve comprising:
a valve body having an inlet sleeve and an outlet sleeve each connected to an external entry port, the inlet sleeve and the outlet sleeve each having arched profiles in the longitudinal direction that converge to form a weir and a circular cross-section at the external entry port;
a fluid flow chamber where the inlet and outlet sleeves converge, the fluid chamber having one part integral with the valve body and peripherally delimited by a body clamping flange, and another part comprising a bonnet to be sealably secured onto said valve body, the bonnet having a peripheral bonnet clamping flange coincident with the body clamping flange;
a valve seat defined by the weir, the valve seat having an arched profile of substantially elliptical curvature and a flattened central surface; and
an open/close element comprising a diaphragm made of an elastomeric material, the diaphragm comprising a peripheral sealing flange to be clamped between the body clamping flange and the bonnet clamping flange, said sealing flange being connected to a central dome having a convex side and a concave side, the concave side being oriented, in an unstressed position, toward the valve seat, wherein the cross sections of the inlet sleeve and the outlet sleeve each have a semi-elliptical shape at the respective openings into the fluid flow chamber, the semi-elliptical shape being defined by an arched portion on the outer side and a flattened portion on the inner side, the semi-elliptical shapes converging at the valve seat to provide the substantially elliptical curvature,
wherein the sealing flange of the diaphragm has an elongated shape inscribing the dome of the diaphragm,
wherein the sealing flange is joined to the dome along a substantially elliptical edge having a longer central axis and a shorter central axis, and
wherein the dome is substantially shaped like a sector of an ellipsoid so to cooperate with the valve seat, the dome comprising a plurality of ribs disposed in symmetrical position essentially parallel to a shorter axis of the dome,

further comprising means for elastically preloading the dome of the diaphragm towards the valve seat,

wherein said means for elastically preloading comprise a spring interposed between the opposing surfaces of the bonnet and the dome, a rigid pressure element of a shape corresponding to the concave side of the dome being interposed between said spring and said dome.

26. (previously presented) The valve as claimed in claim 1, wherein the valve body is made of plastic, the fluid flow chamber further comprising two pocket-like chambers closed at their external sides and open at their internal sides, the pocket-like chambers being disposed in adjacent positions, the internal sides of the pocket-like chambers being connected to a common opening of the fluid flow chamber the common opening having an elongated shape in the flow direction and being surrounded by the body clamping flange of a cooperating elongated shape, the two pocket-like chambers having each two opposed walls and having upper edges of concave shape that face the opening and that slope in the direction of the central area of the fluid flow chamber from the two opposing points substantially level with the edge of the opening, said upper edges of the two opposed walls being connected to each other by a surface forming the valve seat.

27. (previously presented) The valve as claimed in claim 26, wherein the walls of the pocket-like chambers are substantially perpendicular to the flow direction, and wherein the inlet sleeve and the outlet sleeve have longitudinal axes substantially perpendicular to the walls of the pocket-like chambers.

28. (previously presented) A diaphragm valve comprising:
a valve body having an inlet sleeve and an outlet sleeve each connected to an external entry port, the inlet sleeve and the outlet sleeve each having arched profiles in the longitudinal direction that converge to form a weir and a circular cross-section at the external entry port;
a fluid flow chamber where the inlet sleeve and the outlet sleeve converge, the fluid chamber having one part integral with the valve body and peripherally delimited by a body clamping flange, and another part comprising a bonnet to be sealably secured onto said valve body, the bonnet having a peripheral bonnet clamping flange coincident with the body clamping flange;

a valve seat defined by the weir, the valve seat having an arched profile of substantially elliptical curvature and a flattened central surface; and

an open/close element comprising a diaphragm made of an elastomeric material, the diaphragm comprising a peripheral sealing flange configured to be clamped between the body clamping flange and the bonnet clamping flange, said sealing flange being connected to a central dome having a convex side and a concave side, the concave side being oriented, in an unstressed position, toward the valve seat;

wherein cross sections of the inlet sleeve and the outlet sleeve each have a semi-elliptical shape at the respective openings into the fluid flow chamber, the semi-elliptical shape being defined by an arched portion on the outer side and a flattened portion on the inner side, the semi-elliptical shapes converging at the valve seat to provide the substantially elliptical curvature,

wherein the sealing flange of the diaphragm has an elongated shape inscribing the dome of the diaphragm,

wherein the sealing flange is joined to the dome along a substantially elliptical edge having a longer central axis and a shorter central axis, and

wherein the dome is substantially shaped like a sector of an ellipsoid so to cooperate with the valve seat, the dome comprising a plurality of ribs disposed in symmetrical position essentially parallel to a shorter axis of the dome,

wherein the valve body is made of plastic,

wherein the fluid flow chamber further comprises,

two pocket-like chambers closed at their external sides and open at their internal sides, the pocket-like chambers being disposed in adjacent positions, the internal sides of the pocket-like chambers being connected to a common opening of the fluid flow chamber, the common opening having an elongated shape in the flow direction and being surrounded by the body clamping flange of a cooperating elongated shape,

the two pocket-like chambers having each two opposed walls and further having upper edges of concave shape that face the opening and that slope in the direction of the central area of the fluid flow chamber from two opposing points substantially level with the edge of the opening, said upper edges of the two opposed walls being connected to each other by a surface forming the valve seat, and

wherein the two opposed walls of the two pocket-like chambers are divergent and connected together by a plurality of stiffening ribs that are oriented perpendicular to the body clamping flange and parallel to the flow direction.

29. (previously presented) A valve as claimed in claim 28, wherein at least some of the plurality of stiffening ribs connecting the opposed walls of the two pocket-like chambers extend for the entire length of the two opposed walls in a direction perpendicular to the body clamping flange.

30. (previously presented) A valve as claimed in claim 28, wherein at least some of the stiffening ribs connecting the two pocket-like chambers extend for the entire length of the two opposed walls of said pocket-like chambers to reach the outer surface of the valve body, thereby forming supporting feet.

31. (previously presented) The valve as claimed in claim 1, wherein the bonnet is made of a resilient material, and wherein the resilient material is plastic or sheet metal.

32. (previously presented) The valve as claimed in claim 1, wherein the sealing flange is clamped between the body clamping flange and the bonnet clamping flange by four or more fastening bolts in the proximity of the corners of the shorter sides of said body clamping and bonnet clamping flanges.

33. (previously presented) The valve as claimed in claim 32, wherein the body clamping flange and the bonnet clamping flange have substantially rectangular shapes.

34. – 39. (canceled)

40. (previously presented) A diaphragm open/close element for a diaphragm valve comprising:

a single level dome having a concave side and a convex side, the dome being shaped like a portion of an ellipsoid and having a longer central axis and a shorter central axis; and

a peripheral sealing flange having a substantially rectangular shape, the sealing flange being joined to the dome and surrounding the dome.

wherein the dome comprises,

at least one stiffening rib extending along the longer central axis and a plurality of ribs disposed in symmetrical positions essentially parallel to the shorter central axis, the stiffening rib and the plurality of ribs being disposed on the concave side of the dome,
and

a centrally disposed circular stiffening member on the concave side of the dome,
wherein the plurality of ribs oriented parallel to the shorter central axis of the dome connect the longer central axis with the periphery of the dome, and

~~The diaphragm open/close element as claimed in claim 39,~~ wherein all ribs and the central stiffening member are locally thickened wall portions of the dome,

wherein the dome has a constant thickness, and

wherein at least some of the ribs have a thickness that progressively increases in the direction of the center of the dome.

41. (previously presented) The valve as claimed in claim 1, further comprising a measuring device integrated with the inlet sleeve of the valve body.